

STIRLING/PULSE TUBE HYBRID CRYOCOOLER
WITH GAS FLOW SHUNT

ABSTRACT OF THE DISCLOSURE

A two-stage hybrid cryocooler includes a first-stage Stirling expander
5 having a first-stage regenerator having a first-stage-regenerator inlet and a first-
stage-regenerator outlet, and a second-stage pulse tube expander. The second-
stage pulse tube expander includes a second-stage regenerator having a second-
stage regenerator inlet in gaseous communication with the first-stage regenerator
10 outlet, and a second-stage regenerator outlet, and a pulse tube having a pulse-tube
inlet in gaseous communication with the second-stage regenerator outlet, and a
pulse-tube outlet. The second-stage regenerator and the pulse tube together
provide a first gas-flow path between the first-stage regenerator and the pulse-tube
outlet. A pulse tube pressure drop structure has a pulse-tube-pressure-drop inlet
15 in gaseous communication with the pulse-tube outlet, and a pulse-tube pressure-
drop outlet, and a gas volume is in gaseous communication with the pulse-tube
pressure-drop outlet. A gas flow shunt provides gaseous communication between
the first-stage regenerator and the pulse-tube outlet. The gas flow shunt provides
a second gas-flow path between the first-stage regenerator and the pulse-tube
outlet.